Claims

1. A method of deriving a measure of engine shaft output comprising;
measuring cylinder pressure during a cylinder cycle;
constructing a pressure variation function;
obtaining a measure of work done on the piston in the cylinder therefrom and deriving the measure of shaft output from the measure of work done.

2. A method as claimed in claim 1 further including identifying a measure of engine friction losses and subtracting these from the measure of work done on the piston to derive the measure of shaft output.

3. A method as claimed in claim 2 in which the engine friction losses are is derived from a map and/or model.

4. A method as claimed in claim 2 in which engine friction losses are measured by skip firing an engine cylinder cycle and measuring corresponding vehicle deceleration.

5. A method as claimed in claim 3 in which the derived engine friction losses are correlated against the measured engine friction losses to refine the map or model.

6. A method of controlling vehicle performance comprising deriving a measure of work done on the piston in an engine cylinder, deriving a measure of engine shaft output therefrom and adjusting a performance input variable to control the derived measure of engine shaft output to a target value or range.

7. A method as claimed in claim 6 in which the engine shaft output is derived by a method as claimed in any of claims 1 to 5.

8. A method of deriving a measure of engine friction losses comprising measuring cylinder pressure during a cylinder cycle, constructing a pressure variation function, obtaining a measure of work done on a piston in the cylinder therefrom, obtaining a measure of engine shaft output, and deriving the engine friction losses from the difference between these values.

9. A method as claimed in claim 8 in which the engine friction losses are derived at predetermined intervals.

10. A method of controlling vehicle performance comprising deriving a measure of engine friction losses, obtaining a measure of work done on a piston in an engine cylinder and adjusting a performance input variable to control a measure of engine shaft output to a target value or range to obtain a target measure of engine shaft output.

11. A method as claimed in claim 10 in which the engine friction losses are derived by a method as claimed in claim 8 or 9.

12. A method of monitoring vehicle performance comprising deriving a measure of work done on a piston in a engine cylinder, deriving a measure of engine shaft output and/or a measure of engine friction losses therefrom, obtaining separately a measure of engine shaft output and/or engine friction losses estimate and comparing the or each estimate against the respective derived value to correct the estimate.

13. A method as claimed in claim 12 in which engine shaft output is derived by a method as claimed in any of claims 1 to 5 and engine friction loss is derived by a method as claimed in claims 8 or 9.

14. A method of controlling vehicle performance comprising monitoring vehicle performance by a method as claimed in claim 12 or claim 13 and adjusting a performance input variable to control the derived measure of engine shaft output to a target measure of engine shaft output.

15. A method of deriving engine cylinder top dead centre comprising measuring cylinder pressure during a cylinder cycle, constructing a pressure variation function and deriving top dead centre therefrom.

16. A method as claimed in claim 15 in which the devised top dead centre is a thermodynamic top dead centre derived at a maximum pressure point of the motoring pressure curve.

17. A method as claimed in claim 16 in which motoring pressure is derived by skip firing an engine cylinder.

18. A method as claimed in any of claims 16 to 17 in which the maximum pressure is interpolated from the motoring pressure curve.

19. A method as claimed in any of claims 16 to 18 in which the mechanical top dead centre is obtained by applying an offset to the thermodynamic top dead centre.

20. A method as claimed in claim 19 in which the offset is derived from a map or model.

21. A method of obtaining the indicated mean effective pressure IMEP for a vehicle engine cylinder comprising measuring the cylinder pressure during a cylinder cycle, obtaining corresponding values of cylinder volume during the cycle, deriving top dead centre during the cycle, correcting the volume values based on the derived value of top dead centre, and integrating pressure against volume to obtain the IMEP.

22. A method as claimed in claim 21 in which top dead centre is derived as claimed in any of claims 15 to 20.

23. A method of controlling vehicle performance comprising obtaining IMEP by a method as claimed in claim 21 or 22, deriving a vehicle performance output value from the IMEP and adjusting a vehicle performance input variable to control the derived vehicle performance output value to a target vehicle performance output value.

24. A method of controlling the timing of a combustion event in an engine cylinder comprising deriving cylinder top dead centre by a method as claimed in any of claims 15 to 20 and obtaining a combustion timing control value as a function of the derived top dead centre.

25. A method as claimed in claim 24 in which a combustion event comprises a spark induced event or a compression induced event.

26. A method of diagnosing engine conditions in an engine with two or more cylinders comprising the steps of skip firing individual cylinders, deriving a measure of engine friction loss and comparing the derived loss to diagnose a respective cylinder condition.

27. An engine management system for an internal combustion engine having at least one cylinder pressure sensor and a data processor arranged to receive the pressure measurements during a cylinder cycle from the cylinder pressure sensor and process the measured pressure according to a method as claimed in any preceding claim.

28. An engine management system for an internal combustion engine having at least one cylinder pressure sensor and at least one engine actuator and a data processor arranged to receive pressure measurements during a cycle from the cylinder pressure sensor and an actuator controller arranged to control the actuator according to a performance input variable to carry out a method as claimed in any of claims 1 to 26.

29. A computer readable medium containing processing instructions to enable a processor to carry out a method as claimed in any of claims 1 to 26.